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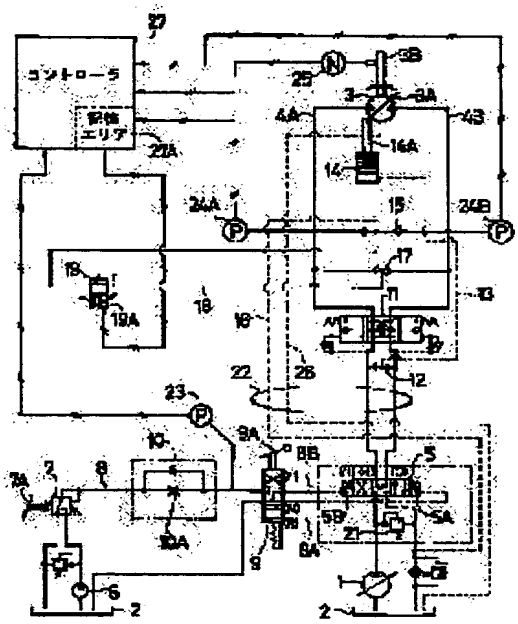
(54) HYDRAULIC MOTOR DRIVE CIRCUIT FOR TRAVELING OF WORK VEHICLE

(57)Abstract:

PURPOSE: To determine a running state of a vehicle, and set a relief pressure changeably for the whole speed range of the vehicle for reducing shock at the time of deceleration or acceleration effectively.

CONSTITUTION: A pilot pressure in a pilot pipeline 8 is read from a pressure sensor 23 into a controller 7, and it is judged by the controller 27 if a vehicle is being decelerated, stopped, started, or accelerated based on the pilot pressure, etc., in accordance with an operation quantity of a traveling pedal 7A. When it is judged that the vehicle is under deceleration, a relief set pressure of a relief valve 19 is controlled to be a relief pressure in accordance with a traveling speed at this time, so a brake pressure in accordance with a motion quantity or motion energy at this time is applied to a hydraulic motor 3 to the vehicle traveling with the motion quantity or motion energy in accordance with the running speed. When the vehicle is being stopped, started, or accelerated, the relief set pressure of the relief valve 19 is controlled to be a relief pressure which is suitable for stopping starting, or acceleration in accordance with the pilot pressure at this time.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The hydraulic motor for transit which makes it run said car by being carried in a car, connecting with the hydraulic pump driven by the prime mover, this hydraulic pump, and a tank through the main line of a pair, and carrying out the feeding and discarding of the pressure oil from this hydraulic pump, The control valve which controls the flow rate and direction of a pressure oil by which are located between this hydraulic motor, and a hydraulic pump and a tank, and are established in the middle of said each main line, and feeding and discarding are carried out to this hydraulic motor, The actuation means for transit which carries out change-over actuation of this control valve according to a control input, and a control input detection means to detect the control input of this actuation means, When the pressure which is located between said hydraulic motors and control valves, is prepared in the middle of said each main line, and acts on said hydraulic motor exceeds a necessary set pressure The relief ****** means of the adjustable type which makes the excessive pressure at this time relieve, A speed detection means to detect the travel speed of said car, and a run state distinction means to distinguish the run state of said car based on the signal from said control input detection means at least, When it distinguishes that said car is slowing down with this run state distinction means The oil pressure motorised circuit for transit of the activity car which it comes to constitute from a control signal output means to output the control signal for moderation to said relief ****** means so that the set pressure of said relief ****** means may be controlled to the pressure which was suitable based on the signal from said speed detection means at the time of moderation.
[Claim 2] Said control signal output means is the oil-pressure motorised circuit for transit of the activity car according to claim 1 which becomes as a configuration which outputs the control signal for acceleration to said relief ****** means so that the set pressure of said relief ****** means may be controlled to the pressure which was suitable based on the signal from said control input detection means at the time of acceleration, when it distinguishes that said car is accelerating with said run state distinction means.
[Claim 3] Said control signal output means is the oil pressure motorised circuit for transit of the activity car according to claim 1 which becomes as a configuration which controls the set pressure of said relief ****** means to the pressure which was suitable at the time of a halt when it distinguishes that said car is stopping with said run state distinction means.
[Claim 4] Said run state distinction means is the oil pressure motorised circuit for transit of the activity car according to claim 1, 2, or 3 which comes to distinguish the run state of said car based on the signal from said control input detection means, and the signal from said speed detection means.
[Claim 5] It is the oil pressure motorised circuit for transit of the activity car according to claim 1, 2, or 3 with which it is located in the middle of the main line of said pair between said hydraulic motors and control valves, the pressure detection means of a pair is established, and said run state distinction means comes to distinguish the run state of said car based on the signal from this each pressure detection means, the signal from said control input detection means, and the signal from said speed detection means.
[Claim 6] It is the oil pressure motorised circuit for transit of an activity car according to claim 1, 2, 3, 4, or 5 which it is located between said hydraulic motors and control valves in the middle of the main line of said pair, prepare a counterbalance valve, said relief ****** means is located between this counterbalance valve and a hydraulic motor, and it comes to prepare in the middle of said each main line.
[Claim 7] The high-pressure selection valve which said relief ****** means is located between said counterbalance valves and hydraulic motors, is arranged between the main lines of said pair, and chooses the pressure oil of the high-tension side among this each main line, The oil pressure motorised circuit for transit of the activity car according to claim 6 which it comes to constitute from a relief valve of the set-pressure adjustable type which is prepared in the middle of a tank duct, and sets relief ** as adjustable with the control signal from said control signal output means

which connects this high-pressure selection valve with a tank.
[Claim 8] Said relief ****** means is oil pressure motorised circuit for transit of the activity car according to claim 6 which it comes to constitute from an overload relief valve of the pair which was located between said counterbalance valves and hydraulic motors, and was arranged between the main lines of said pair, respectively, and a pressure control valve of the adjustable type which controls relief ** of each of this overload relief valve by the control signal from said control signal output means to adjustable.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the oil pressure motorised circuit for transit of the activity car which prevented that used for hydraulic-drive cars, such as for example, a wheel mounted hydraulic excavator or a wheel loader, and an impact occurred especially about the oil pressure motorised circuit for transit of a suitable activity car at the time of moderation of a car or acceleration.
[0002]
[Description of the Prior Art] The hydraulic pump which it is carried in hydraulic-drive type activity cars, such as a wheel mounted hydraulic excavator, and is generally driven by the prime mover, The rotation drive of the wheel (wheel) of the front back etc. is carried out by carrying out the feeding and discarding of the pressure oil from this hydraulic pump. It is located between this hydraulic motor, and a hydraulic pump and a tank. [the hydraulic motor for transit which makes it run said car, and] The control valve which controls the flow rate and direction of a pressure oil by which are established in the middle of the main line of a pair, and feeding and discarding are carried out to this hydraulic motor, The actuation means for transit which carries out change-over actuation of this control valve according to a control input, and a control input detection means to detect the control input of this actuation means, When it is located between said hydraulic motors and control valves, and is prepared between the main lines of said pair and said control valve returns to a center valve position The counterbalance valve which this control valve is interlocked with [counterbalance valve] and generates the braking pressure force of said hydraulic motor, If it is located between this counterbalance valve and a hydraulic motor, and is prepared between the main lines of said pair and the braking pressure force of said hydraulic motor exceeds predetermined high-pressure level The tank duct which is located between the overload relief valve which makes a pressure relieve, and said counterbalance valve and hydraulic motor, is prepared in the middle of the main line of a pair, and derives the braking pressure force of said hydraulic motor to Tanggu, It is prepared in the middle of this tank duct, and operates according to the detection value of said control input detection means. The oil pressure motorised circuit for transit of the activity car equipped with the relief valve gear which sets the braking pressure force of said hydraulic motor as a pressure lower than the relief set pressure of said overload relief valve is known by JP,2-144824,U etc.
[0003] With this kind of conventional technique, the rotation drive of the wheel (wheel) of the front back etc. is carried out, and it is made to carry out transit of the car on the street by operating the actuation means for transit, carrying out change-over actuation of the control valve from a center valve position, and carrying out the feeding and discarding of the pressure oil from a hydraulic pump to a hydraulic motor. and when making the control input of said actuation means small in the middle of transit on the street and carrying out sudden moderation of the car Since the detection value of a control input detection means becomes small, a relief valve gear operates by this. He sets the braking pressure force of said hydraulic motor as a pressure lower than the relief set pressure of an overload relief valve, and is trying to make the impact at the time of moderation ease by carrying out low voltage relief of the braking pressure force at this time with a relief valve gear.
[0004] Moreover, the oil pressure motorised circuit for transit by this conventional technique When it is located in the discharge side of said hydraulic pump, and is prepared between tanks and the driving pressure force of said hydraulic motor exceeds predetermined high-pressure level It operates according to the relief valve of Maine which makes a pressure relieve, and the detection value of said control input detection means. It has other relief valve gears which set the driving pressure force of said hydraulic motor as a pressure lower than the relief set pressure of the relief valve of said Maine. A car sudden start and when carrying out sudden acceleration Since the actuation means for said transit recovers from the condition that a control input is small, it comes to recover from the condition that the detection value

of said control input detection means i[redacted]o small. A relief valve gear besides the[redacted]ve sets the driving pressure force of a hydraulic motor as a pressure lowe[redacted]han the relief set pressure of the relief valve of said Maine, and he is trying to make the impact at the time of acceleration ease at the time of start by carrying out low voltage relief of the driving pressure force at this time with other relief valve gears.

[0005]

[Problem(s) to be Solved by the Invention] By the way, with the conventional technique mentioned above, since the relief valve gear was operated according to the control input of an actuation means at the time of moderation of a car and the braking pressure force of a hydraulic motor is set as a pressure lower than the relief set pressure of an overload relief valve, the braking pressure force at this time cannot be set as the pressure corresponding to the travel speed of a car, but there is a problem of the ability not to make the impact at the time of moderation ease effectively.

[0006] moreover, also in the time of sudden start of a car and sudden acceleration, the relief valve gear of others almost similarly is operated with the time of moderation, and the driving pressure force of a hydraulic motor is set as a pressure lower than the relief set pressure of the relief valve of Maine -- **** -- it does not pass but there is a problem that the impact at the time of start and acceleration cannot be eased effectively.

[0007] Furthermore, it is necessary to prepare separately the relief valve gear which sets up relief ** at the time of moderation, and other relief valve gears which set up relief ** at the time of acceleration at the time of start, and there is a problem that the whole structure is complicated.

[0008] The oil pressure motorised circuit for transit of the activity car which forbade actuation of this overload relief valve is proposed by JP,2-243833,A until it sets up the driving pressure force of a hydraulic motor by the relief valve of Maine at the time of acceleration of a car, it, on the other hand, sets up the braking pressure force of a hydraulic motor by the comparatively low-pressure overload relief valve as other conventional techniques at the time of moderation of a car and a control valve is returned to a center valve position. However, since the impact at the time of start and acceleration cannot be eased but it is always set as fixed relief ** by the overload relief valve in this case at the time of moderation, there is a problem that can continue the impact at the time of moderation and it cannot be eased in a full speed region.

[0009] This invention was made in view of the problem of the conventional technique mentioned above, and this invention can distinguish the run state of a car, and while covering the full speed region of a car and being able to set relief ** as adjustable, it aims at offering the oil pressure motorised circuit for transit of the activity car which enabled it to ease the impact at the time of moderation and acceleration effectively.

[0010]

[Means for Solving the Problem] The hydraulic pump which this invention is carried in a car in order to solve the technical problem mentioned above, and is driven by the prime mover, The hydraulic motor for transit which makes it run said car by connecting with this hydraulic pump and a tank through the main line of a pair, and carrying out the feeding and discarding of the pressure oil from this hydraulic pump, The control valve which controls the flow rate and direction of a pressure oil by which are located between this hydraulic motor, and a hydraulic pump and a tank, and are established in the middle of said each main line, and feeding and discarding are carried out to this hydraulic motor, The actuation means for transit which carries out change-over actuation of this control valve according to a control input, and a control input detection means to detect the control input of this actuation means, When the pressure which is located between said hydraulic motors and control valves, is prepared in the middle of said each main line, and acts on said hydraulic motor exceeds a necessary set pressure The relief ****** means of the adjustable type which makes the excessive pressure at this time relieve, A speed detection means to detect the travel speed of said car, and a run state distinction means to distinguish the run state of said car based on the signal from said control input detection means at least, When it distinguishes that said car is slowing down with this run state distinction means The configuration which consists of a control signal output means to output the control signal for moderation to said relief ****** means is adopted so that the set pressure of said relief ****** means may be controlled to the pressure which was suitable based on the signal from said speed detection means at the time of moderation.

[0011] Moreover, when it distinguishes that said car is accelerating with said run state distinction means, said control signal output means is good also as a configuration which outputs the control signal for acceleration to said relief ****** means so that the set pressure of said relief ****** means may be controlled to the pressure which was suitable based on the signal from said control input detection means at the time of acceleration.

[0012] Furthermore, said control signal output means is good also as a configuration which controls the set pressure of said relief ****** means to the pressure which was suitable at the time of a halt, when it distinguishes that said car is stopping with said run state distinction means.

[0013] On the other hand, said run state distinction means may distinguish the run state of said car based on the signal

from said control input detection mea[redacted]nd the signal from said speed detection [redacted]ns.
[0014] Moreover, between said hydrau[redacted] motors and control valves, it is located in the middle of the main line of said pair, the pressure detection means of a pair is established, and said run state distinction means is good also as a configuration which comes to distinguish the run state of said car based on the signal from this each pressure detection means, the signal from said control input detection means, and the signal from said speed detection means.
[0015] And it is desirable for it to be located between said hydraulic motors and control valves in the middle of the main line of said pair, and to prepare a counterbalance valve, and for it to be located between this counterbalance valve and a hydraulic motor, and to establish said relief ****** means in the middle of said each main line.
[0016] In this case, what is necessary is to be located between said counterbalance valves and hydraulic motors, to arrange said relief ****** means between the main lines of said pair, and just to constitute from a high-pressure selection valve which chooses the pressure oil of the high-tension side among this each main line, and a relief valve of the set-pressure adjustable type which is prepared in the middle of a tank duct, and sets relief ** as adjustable with the control signal from said control signal output means which connects this high-pressure selection valve with a tank.
[0017] Moreover, you may make it constitute from an overload relief valve of the pair which was located between said counterbalance valves and hydraulic motors, and was arranged between the main lines of said pair in said relief ****** means, respectively, and a pressure control valve of the adjustable type which controls relief ** of each of this overload relief valve by the control signal from said control signal output means to adjustable.
[0018]
[Function] When it distinguishes that can distinguish the run state of a car at an early stage based on the control input of the actuation means for transit, and the car in the middle of transit is slowing down by the above-mentioned configuration As opposed to the car it is running with the energy corresponding to a travel speed since it can be set as relief ** at the time of the moderation according to the travel speed of this car The braking pressure force corresponding to the energy at this time can be made to act on a hydraulic motor, and it can prevent certainly that the braking pressure force becomes excessive or becomes [too little].
[0019] Moreover, at the time of start of a car and acceleration, it can be set as relief ** which was suitable according to the control input of an actuation means at the time of acceleration, and can prevent the driving pressure force of acting on a hydraulic motor becoming excessive, or becoming [too little]. And it can be set as relief ** which was suitable at this at the time of a halt of a car, and a car can be held to a idle state.
[0020]
[Example] Hereafter, based on drawing 1 thru/or drawing 9 , as an oil pressure motorised circuit for transit of an activity car, the oil pressure motorised circuit for wheel mounted hydraulic excavators is mentioned as an example, and the example of this invention is explained.
[0021] Drawing 1 thru/or drawing 7 show the 1st example of this invention.
[0022] 1 is carried in a car, the hydraulic pump of the variable-capacity mold by which a rotation drive is carried out by prime movers (not shown), such as an engine, is shown, and this hydraulic pump 1 absorbs the hydraulic oil in a tank 2, and makes a high-pressure oil (henceforth a pressure oil) breathe out in drawing. 3 shows the hydraulic motor for transit connected with the hydraulic pump 1 and the tank 2 through the main lines 4A and 4B of a pair, this hydraulic motor 3 consists of a variable displacement oil hydraulic motor which has capacity variant part 3A, and the output-shaft 3B is connected with the wheel (neither is illustrated) of the front back through the reducer etc. And this hydraulic motor 3 rotates to the forward direction or hard flow, drives these wheels, and makes it run a car by carrying out the feeding and discarding of the pressure oil from a hydraulic pump 1 through main lines 4A and 4B.
[0023] 5 -- between a hydraulic motor 3, and hydraulic pumps 1 and tanks 2 -- being located -- main lines 4A and 4B -- on the way -- the control valve boiled and prepared is shown, and this control valve 5 has for example, constitutes the oil pressure pilot sections 5A and 5B of a pair by the oil pressure pilot type directional selecting valve of 4 port 3 location -- having -- the below-mentioned pilot pressure Ps change-over location [from center-valve-position (**)] (**) -- or (Ha) it is switched. and the flow rate of the pressure oil which carries out feeding and discarding to a hydraulic motor 3 according to the amount of strokes in case this control valve 5 is switched to change-over location (**) and (Ha) from center-valve-position (**) -- controlling -- change-over location (**) -- change-over control of the hand of cut of a hydraulic motor 3 is carried out to the forward direction or hard flow by the side and the change-over location (Ha) side.

[0024] The hydraulic pump for pilot pressure supply which drives 6 by the prime mover with said hydraulic pump 1, 7 carries out change-over actuation of the control valve 5 at change-over location (**) and a side (Ha) according to the control input of transit pedal 7A from center-valve-position (**). The reducing-valve mold pilot valve as an actuation means for transit to control a travel speed V is shown, the high-tension side is connected to a hydraulic pump 6, the low-

tension side is connected to a tank 2, [illegible]ectively, and the output side is connecte[illegible]h the pilot line 8 for this pilot valve 7. And this pilot valve 7 is the p[illegible] pressure Ps transit pedal 7A prepared in a driver's cabin (not shown) is interlocked with, and corresponding to the control input (the amount of treading in) of this transit pedal 7A. It supplies in a pilot line 8 from a hydraulic pump 6.

[0025] 9 shows the pre-go-astern change-over valve which makes change-over connection of the pilot line 8 at the pilot-line sections 8A and 8B, this pre-go-astern change-over valve 9 is constituted by the directional selecting valve of 4 port 3 location, and change-over actuation is carried out from a center valve position (N) by lever 9A for a change-over prepared in a driver's cabin in an advance location (F) or a go-astern location (R). Here, the pilot-line sections 8A and 8B are pilot pressures Ps, when the pilot pressure Ps from a pilot valve 7 is made to act on oil pressure pilot section 5A when it connects with the oil pressure pilot sections 5A and 5B of a control valve 5 and the pre-go-astern change-over valve 9 is switched to an advance location (F), and switched to a go-astern location (R). It is made to act on oil pressure pilot section 5B.

[0026] The slow return valve as a governor valve which 10 was located between the pilot valve 7 and the pre-go-astern change-over valve 9, and was prepared in the middle of the pilot line 8 is shown, and when it extracts, it has 10A and treading-in actuation of transit pedal 7A is canceled, this slow return valve 10 extracts that a control valve 5 returns to center-valve-position (b) at an early stage, and stops it by 10A.

[0027] The counterbalance valve which 11 was located between the hydraulic motor 3 and the control valve 5, and was prepared in the middle of main lines 4A and 4B is shown, and when interlock, it switches to the driving pressure of advance or go-astern, a control valve 5 returns to center-valve-position (b) and driving pressure decreases, this counterbalance valve 11 is interlocked with this, returns to the location of illustration, and generates the braking pressure force of a hydraulic motor 3 in main-line 4A or 4B.

[0028] The shuttle valve as a high-pressure selection valve which 12 was located between the control valve 5 and the counterbalance valve 11, and was prepared between main-line 4A and 4B is shown. This shuttle valve 12 makes the capacity of a hydraulic motor 3 switched according to the driving pressure force at this time by the below-mentioned servo cylinder 14 by choosing the main lines 4A or 4B which serve as the high-tension side among main lines 4A and 4B, for example, drawing the driving pressure force of a hydraulic motor 3 in the control duct 13.

[0029] 14 shows the servo cylinder attached to the hydraulic motor 3, the tip of drive rod 14A is connected with capacity variant part 3A of a hydraulic motor 3, and this servo cylinder 14 carries out the **** drive of the capacity variant part 3A of a hydraulic motor 3 according to the pressure from the control duct 13. And capacity variant part 3A is always ****(ed) to a small capacity side, this servo cylinder 14 carries out high-speed rotation of the hydraulic motor 3 with small torque, when the pressure from the control duct 13, i.e., the driving pressure force it is weak to motor ******, exceeds place constant pressure, it **** capacity variant part 3A to a large capacity side, and it carries out low-speed rotation of the hydraulic motor 3 with large torque.

[0030] Generating of cavitation is prevented by showing the check valve for a makeup which 15 was located between the hydraulic motor 3 and the counterbalance valve 11, and was prepared between main-line 4A and 4B, and making the hydraulic oil in a tank 2 supply to main lines 4A or 4B, when this check valve 15 is connected with a tank 2 through the tank duct 16 and the inside of main-line 4A or 4B serves as a negative pressure inclination at the time of braking of a hydraulic motor 3 etc.

[0031] Other shuttle valves as a high-pressure selection valve which 17 was located between the hydraulic motor 3 and the counterbalance valve 11, and was prepared between main-line 4A and 4B are shown, and this shuttle valve 17 chooses the main lines 4A or 4B which serve as the high-tension side between a hydraulic motor 3 and a counterbalance valve 11 among main lines 4A and 4B, and draws the pressure oil of the high-tension side in other tank ducts 18. And this tank duct 18 is connected to the tank 2 through said tank duct 16 in the location of the check valve 15 for a makeup.

[0032] the relief valve of the set-pressure adjustable type from which 19 constitutes a relief ****** means with a shuttle valve 17 and the tank duct 18 -- being shown -- this relief valve 19 -- the tank duct 18 -- on the way -- it is alike and prepares -- having -- electromagnetism -- proportionality solenoid section 19A -- the relief ** Pr It is set as adjustable with the property 20 shown in drawing 2 as a continuous line. and the pressure of the pressure oil by which this relief valve 19 is led to the tank duct 18 through a shuttle valve 17 -- electromagnetism -- it has the composition of preventing excessive pressure acting on a hydraulic motor 3, by opening, when the relief set pressure by proportionality solenoid section 19A is exceeded, and making this pressure relieve to a tank 2 through the tank duct 16.

[0033] Moreover, the relief valve of Maine which 21 was located between the hydraulic pump 1, the tank 2, and the control valve 5, and was established in the discharge side of this hydraulic pump 1 is shown, if the pressure of the pressure oil by which this relief valve 21 is breathed out from a hydraulic pump 1, for example, the driving pressure force of a hydraulic motor 3 etc., exceeds predetermined high-pressure level (relief set pressure), this pressure will be

relieved, and it prevents that excessiv[redacted]ssure acts on a hydraulic pump 1 or hy[redacted]ic-motor 3 grade.
[0034] 22 is located between a control [redacted]ve 5 and a counterbalance valve 11, center joints formed in the middle of, such as main lines 4A and 4B, are shown, and this center joint 22 is formed between the base carrier of a wheel mounted hydraulic excavator, and a revolving super-structure (neither is illustrated), and can be made to carry out the feeding and discarding of the pressure oil from a hydraulic pump 1 to a hydraulic motor 3 also at the time of revolution of a revolving super-structure. That is, a hydraulic motor 3 and counterbalance-valve 11 grade are prepared in a base carrier, and hydraulic pumps 1 and 6, the control valve 5, and the pilot valve 7 grade are prepared in the revolving super-structure.
[0035] The pressure sensor as a control input detection means which 23 was located between the pre-go-astern change-over valve 9 and the slow return valve 10, and was established in the middle of the pilot line 8 is shown, and this pressure sensor 23 is the pilot pressure Ps in a pilot line 8. It detects as a control input (the amount of treading in) of transit pedal 7A, and a detecting signal is outputted to the below-mentioned controller 27.
[0036] The pressure sensor as a pressure detection means of a pair which 24A and 24B were located between the hydraulic motor 3 and the counterbalance valve 11, and was established in the middle of main lines 4A and 4B is shown, and these pressure sensors 24A and 24B are the pressures Pa and Pb in main-line 4A and 4B. It detects, respectively and the detecting signal is outputted to a controller 27.
[0037] 25 shows the rotational frequency sensor as a speed detection means established near the output-shaft 3B of a hydraulic motor 3, and this rotational frequency sensor 25 detects the rotational frequency N of a hydraulic motor 3, and outputs the detecting signal to a controller 27.
[0038] 26 shows the drain line of a hydraulic motor 3, it connects with a tank 2 through a center joint 22 with the tank duct 16, and this drain line 26 makes the leakage oil (a part of pressure oil) generated with a hydraulic motor 3 discharge in a tank 2.
[0039] furthermore, 27 shows the controller as a control unit which consists of a microcomputer etc., and the input side connects this controller 27 to pressure sensors 23, 24A, and 24B and rotational frequency sensor 25 grade -- having -- an output side -- the electromagnetism of a relief valve 19 -- it connects with proportionality solenoid section 19A etc. And the program shown in drawing 3 is stored in the store circuit, and this controller 27 performs relief oppression processing of a relief valve 19 etc. moreover -- this -- a controller -- 27 -- a store circuit -- **** -- the -- a storage area -- 27 -- A -- inside -- drawing 4 -- inside -- a continuous line -- illustrating -- a travel speed -- calculation -- a map -- drawing 5 -- inside -- a continuous line -- illustrating -- a property -- 28 -- from -- becoming -- relief -- ****** -- a map -- drawing 6 -- inside -- a continuous line -- illustrating -- a property -- 29 -- from -- becoming -- relief -- ****** -- a map -- a halt -- the time -- being suitable -- relief -- ** -- the set point (not shown) -- and -- drawing 7 -- inside -- a continuous line -- illustrating -- a property -- 30 -- from -- becoming -- a current value -- a conversion map -- etc. etc. -- storing -- having -- **** .
[0040] The relief ****** map which the travel-speed calculation map shown in drawing 4 is constituted here so that the travel speed V of a car may be calculated from the rotational frequency N of the hydraulic motor 3 detected by the rotational frequency sensor 25, and is shown in drawing 5 is relief ** Pr which was suitable based on the travel speed V of a car at the time of moderation. It is constituted so that it may calculate. moreover, pilot pressure Ps in the pilot line 8 which detected the relief ****** map shown in drawing 6 with the pressure sensor 23 as a control input of transit pedal 7A from -- relief ** Pr which was suitable at the time of acceleration of a car It is constituted. So that it may calculate each relief ** Pr according [the current value conversion map shown in drawing 7] to drawing 5 and drawing 6 the control signal which changed into the current value and had this current value -- the electromagnetism of a relief valve 19, when it outputs to proportionality solenoid section 19A Relief ** Pr of this relief valve 19 It is constituted so that it may become the property shown in drawing 2 .
[0041] The oil pressure motorised circuit for wheel mounted hydraulic excavators by this example has a configuration like ****, and describes the actuation below.
[0042] first, in rotating a hydraulic motor 3 normally in order to rotate a next wheel (wheel) in the advance direction and to advance a car before being prepared in the base carrier of a wheel mounted hydraulic excavator If the pre-go-astern change-over valve 9 is switched to an advance location (F) from a center valve position (N) and transit pedal 7A is broken in and operated Pilot pressure Ps according to the control input Oil pressure pilot section 5A of a control valve 5 is supplied through pilot-line section 8A of a pilot line 8 from a pilot valve 7. Change-over actuation of the pilot pressure Ps of strokes, i.e., the amount corresponding to the control input of transit pedal 7A, is carried out from center-valve-position (b) at a change-over location (b) side, and the driving pressure force of a hydraulic motor 3 generates this control valve 5 in main-line 4A. And this control valve 5 controls the flow rate of the pressure oil by which feeding and discarding are carried out to a hydraulic motor 3 from a hydraulic pump 1 according to the control input at this time, and

rotates a hydraulic motor 3 in the forward direction at the rate according to the control input of transit pedal 7A.
[0043] Moreover, if treading-in actuation of transit pedal 7A is canceled, a pilot line 8 will be connected with a tank 2 through a pilot valve 7. The pre-go-astern change-over valve 9 is the pilot pressure Ps supplied to oil pressure pilot section 5A of a control valve 5 since it was switched to the advance location (F). It is gradually discharged through drawing 10A of a slow return valve 10 at a tank 2 side. A control valve 5 returns to center-valve-position (b) from change-over location (b) gradually, and a counterbalance valve 11 is also interlocked with this and it returns to the location of illustration. When a pressure oil comes to be substantially confined between counterbalance valves 11 between a hydraulic motor 3 and a control valve 5 in main-line 4A and 4B by this and a hydraulic motor 3 continues inertia rotation by it, the braking pressure force of a hydraulic motor 3 occurs in the main-line 4B side, and a hydraulic motor 3 stops gradually by wire drawing of a counterbalance valve 11 etc.
[0044] However, when this braking pressure force becomes excessive pressure, since, as for a hand of cut, the high-pressure braking pressure force acts on the reverse sense to the hydraulic motor 3 which continues inertia rotation, an impact which slammed the brake in the whole drive circuit of a hydraulic motor 3 occurs, an operator will sense displeasure, or it will become the hindrance of operation, and driving stability etc. will fall.
[0045] In this example, then, by performing relief oppression processing of a relief valve 19 like the after-mentioned by the controller 27 Relief ** Pr which was suitable for the run state of a car in the relief set pressure of this relief valve 19 It is set as adjustable. When the braking pressure force or the driving pressure force of acting on a hydraulic motor 3 becomes excessive, a relief valve 19 is made to open. The excessive pressure at this time is made to relieve from a shuttle valve 17 to a tank 2 through the tank ducts 18 and 16, and it enables it to ease effectively that an impact occurs at the time of start or acceleration etc. at the time of moderation of a car.
[0046] In addition, when the pre-go-astern change-over valve 9 is switched to a go-astern location (R), according to the control input of transit pedal 7A, a control valve 5 is switched to a change-over location (Ha) side from center-valve-position (**), the driving pressure force of a hydraulic motor 3 occurs in the main-line 4B side, a hydraulic motor 3 rotates to hard flow, and a base carrier (car) goes astern. And if actuation of transit pedal 7A is canceled, it will return to center-valve-position (b) like the time of advance, the braking pressure force will occur in the main-line 4A side in this case, and a hydraulic motor 3 will stop a control valve 5 gradually. Moreover, when the pre-go-astern change-over valve 9 is returned to the center valve position (N), regardless of actuation of transit pedal 7A, a control valve 5 is held at center-valve-position (b).
[0047] Next, with reference to drawing 3 thru/or drawing 7 , relief oppression processing of the relief valve 19 by the controller 27 is explained.
[0048] First, if processing actuation starts, while reading the rotational frequency N of a hydraulic motor 3 from the rotational frequency sensor 25 at step 1, they are pressure sensors 23, 24A, and 24B to the pilot pressure Ps, and pressures Pa and Pb. The acceleration-and-deceleration judging of a car is performed that it should move to read in and step 2, and the run state of a car should be distinguished.
[0049] In this case, pilot pressure Ps detected with the pressure sensor 23 While decreasing, transit pedal 7A detaches and is operated, since the amount of pressure oils by which feeding and discarding are carried out to a hydraulic motor 3 from a hydraulic pump 1 decreases by the control valve 5, it can distinguish, if a car is in a moderation condition at this time, and processing after step 3 mentioned later is performed. Moreover, actuation of transit pedal 7A is canceled and they are the pressures Pa and Pb in main-line 4A and 4B. Since a car can be distinguished [that it is under halt, and] when it is equal substantially, or when the rotational frequency N of a hydraulic motor 3 serves as zero, step 8 mentioned later is processed. Pilot pressure Ps detected with the pressure sensor 23 on the other hand While increasing, treading-in actuation of the transit pedal 7A is carried out, the control input of the time of a car departing or transit pedal 7A becomes large, the flow rate of the pressure oil by which feeding and discarding are carried out to a hydraulic motor 3 increases, and if a car is in an acceleration condition, since it can be distinguished, it processes step 9 mentioned later.
[0050] And it is based on the travel speed V of a car from the relief ****** map of the property 28 which calculates the travel speed V of a car based on said rotational frequency N from the travel-speed map shown in drawing 4 as a continuous line by step 3, moves to step 4, and is shown in drawing 5 as a continuous line when it distinguishes that a car is slowing down at step 2, and is relief ** Pr at the time of moderation. It calculates.
[0051] next -- step 5 -- relief ** Pr at this time the control signal for moderation which changes into a current value with the current value conversion map of the property 30 shown in drawing 7 as a continuous line, moves to step 6, and corresponds to this current value -- the electromagnetism of a relief valve 19 -- relief ** Pr corresponding to [by outputting to proportionality solenoid section 19A] the travel speed V at this time in the relief set pressure of a relief valve 19 It controls to become and a return is carried out at step 7.
[0052] moreover, when it distinguishes that a car is stopping at step 2 Relief ** Pr which was suitable at the time of a

halt from the set point which moved t[illegible]p 8 and has been beforehand set up in s[illegible]ge area 27A It calculates. It is relief ** Pr at this time at step 5. It ch[illegible]es into a current value with the current value conversion map shown in drawing 7 . the control signal for the time of a halt which moves to step 6 and corresponds to this current value -- the electromagnetism of a relief valve 19 -- relief ** Pr to which the relief set pressure of a relief valve 19 was suitable by outputting to proportionality solenoid section 19A at the time of a halt It controls to become.
[0053] furthermore, when it distinguishes that a car is accelerating at step 2 Pilot pressure Ps at the relief ****** map which moves to step 9 and is shown in drawing 6 to this time Relief ** Pr which was based and was suitable at the time of acceleration It calculates. It is relief ** Pr at this time at step 5. It changes into a current value with the current value conversion map shown in drawing 7 . the control signal for acceleration which moves to step 6 and corresponds to this current value -- the electromagnetism of a relief valve 19 -- relief ** Pr to which the relief set pressure of a relief valve 19 was suitable for the acceleration condition at this time by outputting to proportionality solenoid section 19A It controls to become.
[0054] pilot pressure [according to this example in this way] Ps corresponding to the control input of transit pedal 7A etc. -- whether it is based and a car is slowing down When it distinguishes [that it can distinguish certainly and is under moderation and / start and] whether it is under halt, or it is under acceleration Relief ** Pr corresponding to the travel speed V at this time for the relief set pressure of a relief valve 19 By controlling To the car it is running with the momentum or kinetic energy corresponding to a travel speed V, the braking pressure force according to the momentum or kinetic energy at this time can be made to act on a hydraulic motor 3, and it can prevent certainly that the braking pressure force becomes excessive or becomes [too little].
[0055] Moreover, relief ** Pr which was suitable at the time of a halt which set up the relief set pressure of a relief valve 19 beforehand when it distinguished that a car is stopping It can control and a car can be held to a idle state. And at the time of start of a car and acceleration, it is the pilot pressure Ps at this time about the relief set pressure of a relief valve 19. Corresponding start and relief ** Pr which was suitable at the time of acceleration It can set up, when the driving pressure force of acting on a hydraulic motor 3 becomes excessive, a relief valve 19 can be made to be able to open, and the excessive pressure at this time can be made to relieve to a tank 2 through the tank ducts 18 and 16.
[0056] therefore, relief ** Pr corresponding to [at this example / to the time of sudden start and sudden acceleration etc.] the control input of transit pedal 7A for the driving pressure force of a hydraulic motor 3 up to -- it is controllable to decompress certainly, and while being able to prevent effectively that an impact generates a car with a hydraulic motor 3 when carrying out sudden acceleration, sudden start and, start, acceleration, etc. can be smoothly performed by actuation of transit pedal 7A.
[0057] Moreover, it is relief ** Pr in the full speed region of a car ranging from [while being able to prevent effectively that an impact which the braking pressure force according to the kinetic energy of a car can be made to act on a hydraulic motor 3, and slammed the brake at the time of sudden moderation etc. occurs at the time of moderation of a car] the low speed to a high speed. It can be set as adjustable and various effectiveness -- driving stability and safety can be improved -- is done so.
[0058] Drawing 8 the 2nd example of this invention being shown, giving the same sign to the component same in this example as said 1st example, and omitting the explanation next, the description of this example When the pressure which acts on a hydraulic motor 3 exceeds a necessary set pressure, the relief ****** means of the adjustable type which makes the excessive pressure at this time relieve The overload relief valves 31A and 31B of the pair which was located between the counterbalance valve 11 and the hydraulic motor 3, and was arranged between main-line 4A of a pair, and 4B, respectively, The shuttle valve 33 as a high-pressure selection valve which is prepared between pilot-line 32A of these overload relief valves 31A and 31B, and 32B, and chooses the high-tension side among these pilot lines 32A and 32B, It is prepared in the middle of other drain lines 34 which connect this shuttle valve 33 to the drain line 26 of a hydraulic motor 3. Relief ** Pr of the overload relief valves 31A and 31B It is in having constituted from a pressure control valve 36 of the adjustable type controlled by the control signal from a controller 35 to adjustable.
[0059] although a controller 35 is constituted here almost like the controller 27 stated in said 1st example and the map shown in drawing 4 thru/or drawing 7 and the almost same map are stored in the storage area 35A -- this controller 35 -- the electromagnetism of a pressure control valve 36 -- the current value of the control signal outputted to proportionality solenoid section 36A is small set up corresponding to the pressure which acts on a pressure control valve 36. Moreover, while the overload relief valves 31A and 31B are connected to main lines 4A and 4B by the tip side of this duct 37 through the check valve 15 for a makeup by connecting an outflow side to the end face side of a duct 37 between a counterbalance valve 11 and a hydraulic motor 3, it connects also with the tank duct 16.
[0060] And the overload relief valves 31A and 31B are always held at a clausilium condition by the pressure control valve 36 located in the middle of a drain line 34. Each relief ** Pr to which the driving pressure force or the braking

pressure force of acting on a hydrauli[redacted]tor 3 was suitable at the time of moder[redacted] or a halt at the time of start of a car and acceleration When it exceeds [redacted]en a pressure control valve 36 opens by the pilot pressure generated in a drain line 34 Either of the overload relief valves 31A and 31B is interlocked with this, opens, and makes the excessive pressure at this time relieve among main lines 4A and 4B through a duct 37 and the check valve 15 for a makeup in main-line 4A of the low-tension side, or 4B.

[0061] Although this example constituted in this way can also acquire the almost same operation effectiveness as said 1st example Relief ** Pr of the overload relief valves 31A and 31B of the pair which was especially located between the counterbalance valve 11 and the hydraulic motor 3 by this example, and was arranged between main-line 4A of a pair, and 4B, respectively It controls by the pressure control valve 36 to adjustable with the control signal from a controller 35. This pressure control valve 36 The inside of the pilot lines 32A and 32B of the overload relief valves 31A and 31B, After considering as the configuration which prepares the high-tension side in the middle of other drain lines 34 connected to the drain line 26 of a hydraulic motor 3 through a shuttle valve 33 the pressure which acts on a pressure control valve 36 as compared with the pressure which acts on the overload relief valves 31A and 31B is fallen sharply -- it can make -- this pressure control valve 36 -- electromagnetism -- with proportionality solenoid section 36A, it can miniaturize and a cost cut can be aimed at.

[0062] Drawing 9 this example as the 3rd example of this invention being shown, giving the same sign to the same component as said 1st example, and omitting the explanation next, the description of this example When the pressure which acts on a hydraulic motor 3 exceeds a necessary set pressure, the relief ****** means of the adjustable type which makes the excessive pressure at this time relieve The by-pass lines 41A and 41B of the pair which was located between the counterbalance valve 11 and the hydraulic motor 3, and was connected between main-line 4A of a pair, and 4B, respectively, It is prepared in the middle of these by-pass lines 41A and 41B, respectively, and is relief ** Pr by the control signal from a controller 42. It is in having constituted from relief valves 43A and 43B of the set-pressure adjustable type of the pair controlled to adjustable.

[0063] although a controller 42 is constituted here almost like the controller 27 stated in said 1st example and the map shown in drawing 4 thru/or drawing 7 and the almost same map are stored in the storage area 42A -- this controller 42 -- the electromagnetism of relief valves 43A and 43B -- it has composition which outputs the object for moderation, the object for acceleration, or the control signal for a halt to the proportionality solenoid sections 44A and 44B, respectively.

[0064] Moreover, it has guaranteed that by-pass lines 41A and 41B prevent that between main-line 4A and 4B is open for free passage through by-pass lines 41A and 41B by always holding the relief valves 43A and 43B located in the middle at a clausilium condition, and the driving pressure force or braking pressure force of a hydraulic motor 3 generates them in main-line 4A and 4B. And each relief ** Pr to which the driving pressure force or the braking pressure force of acting on a hydraulic motor 3 was suitable at the time of moderation or a halt at the time of start of a car and acceleration When it exceeds, the excessive pressure at this time is made to relieve among main lines 4A and 4B in main-line 4A of the low-tension side, or 4B, when either of the relief valves 43A and 43B opens in the middle of by-pass lines 41A and 41B.

[0065] Although this example constituted in this way can also acquire the almost same operation effectiveness as said 1st example Since it was especially located between the counterbalance valve 11 and the hydraulic motor 3 by this example and relief valves 43A and 43B were arranged through by-pass lines 41A and 41B, respectively between main-line 4A of a pair, and 4B The shuttle-valve 17 grade used in said 1st example can be made unnecessary, and a hydraulic circuit can be simplified.

[0066] Moreover, controllers 42 are the pressures Pa and Pb in main-line 4A and 4B from pressure sensors 24A and 24B. Read in, these pressures Pa and Pb What is necessary is to output a control signal to the proportionality solenoid sections 44A and 44B alternatively, and just to make. being based -- the electromagnetism of relief valves 43A and 43B -- In this case, pressures Pa and Pb It is the pressure Pa in main-line 4A inside. When high, a control signal is outputted to relief-valve 43A, and it is the pressure Pb in main-line 4B. By outputting a control signal to relief-valve 43B, when high Each relief ** Pr which was [in the driving pressure force or the braking pressure force of acting on a hydraulic motor 3] suitable at the time of moderation or a halt at the time of start of a car and acceleration It can stop below and driving stability and safety can be improved effectively.

[0067] In addition, said each example shows the example of a run state distinction means by which step 2 is the requirements for a configuration of this invention among the programs shown in drawing 3 , step 3 shows the example of a speed detection means in it, and step 4 - step 9 show the example of a control signal output means in it.

[0068] moreover, pilot pressure Ps detected with the pressure sensor 23 in said each example etc., although stated as what is based and distinguishes the run state of a car If the signal from the pre-go-astern change-over valve 9 is read at

step 1 which changes to this and is sh[redacted]in drawing 3 , in the condition that the [redacted]go-astern change-over valve 9 is switched to the advance location (F), for example Pressure Pa in main-line 4A among main lines 4A and 4B Pressure Pb in main-line 4B It can distinguish, if a car is in an acceleration condition when high, and it is the pressure Pb in main-line 4B. It can distinguish, if it is in a moderation condition when higher than the pressure Pa in main-line 4A. Moreover, it is the pressure Pa in main-line 4A in the condition that can distinguish the time of acceleration and the pre-go-astern change-over valve 9 is switched to the center valve position (N) at the time of moderation of a car, almost like [also when the pre-go-astern change-over valve 9 is switched to the go-astern location (R)] this. Pressure Pb in main-line 4B It can distinguish that a car is stopping, when equal.

[0069] In said each example, furthermore, in storage area 27A (35A, 42A) of a controller 27 (35 42) Although stated as what stores the relief ****** map which consists of a property 29 illustrated as the continuous line in the relief ****** map which consists of a property 28 illustrated as the continuous line in drawing 5 , and drawing 6 It changes to this and you may make it store a relief ****** map with the properties 28A and 29A as shown by the dotted line in drawing 5 and drawing 6 in storage area 27A (35A, 42A), respectively.

[0070] on the other hand -- said each example -- relief ** Pr of a relief valve 19 (31A, 31B, 43A, 43B) electromagnetism, although stated as what is set as adjustable with the property 20 shown in drawing 2 as a continuous line by proportionality solenoid section 19A (36A, 44A, 44B) property 20A shown by the dotted line in drawing 2 which changes to this and serves as a reverse property in a property 20 -- having -- a relief valve 19 (31A and 31B --) Relief ** Pr of 43A and 43B When you may make it set it as adjustable and a disconnection fault etc. occurs in this case, it is relief ** Pr of a relief valve 19 (31A, 31B, 43A, 43B). It can hold to the maximum high pressure and a failsafe function can be given. Moreover, what is necessary is just to consider as the configuration which stores the current value conversion map which consists of property 30A shown by the dotted line in drawing 7 in this case in storage area 27A (35A, 42A).

[0071]

[Effect of the Invention] The relief ****** means of the adjustable type which according to this invention it is located [type] between a hydraulic motor and a control valve, and makes excessive pressure relieve in the middle of each main line as explained in full detail above is established. When it distinguishes at least that it is the run state of a car at the moderation time based on the signal from the control input detection means for transit Since the control signal for moderation was outputted to the relief ****** means and the set pressure of this relief ****** means was considered as the configuration controlled to the pressure which was suitable based on the signal from a speed detection means at the time of moderation Based on the control input of the actuation means for transit, the run state of a car can be distinguished at an early stage, and when it distinguishes that the car in the middle of transit is slowing down, it can be set as relief ** at the time of the moderation according to the travel speed of this car. And to the car it is running with the energy corresponding to a travel speed, the braking pressure force corresponding to the energy at this time can be made to act on a hydraulic motor, and it can prevent certainly that the braking pressure force becomes excessive or becomes [too little].

[0072] Moreover, at the time of start of a car and acceleration, it can be set as relief ** which was suitable according to the control input of said actuation means at the time of acceleration, and can prevent the driving pressure force of acting on a hydraulic motor becoming excessive, or becoming [too little]. And it can be set as relief ** which was suitable at this at the time of a halt of a car, and a car can be held to a idle state.

[0073] Therefore, various effectiveness -- the full speed region of a car can be covered, relief ** can be set as adjustable, the impact at the time of moderation and acceleration can be eased upwards effectively, and driving stability and safety can be raised certainly -- is done so.

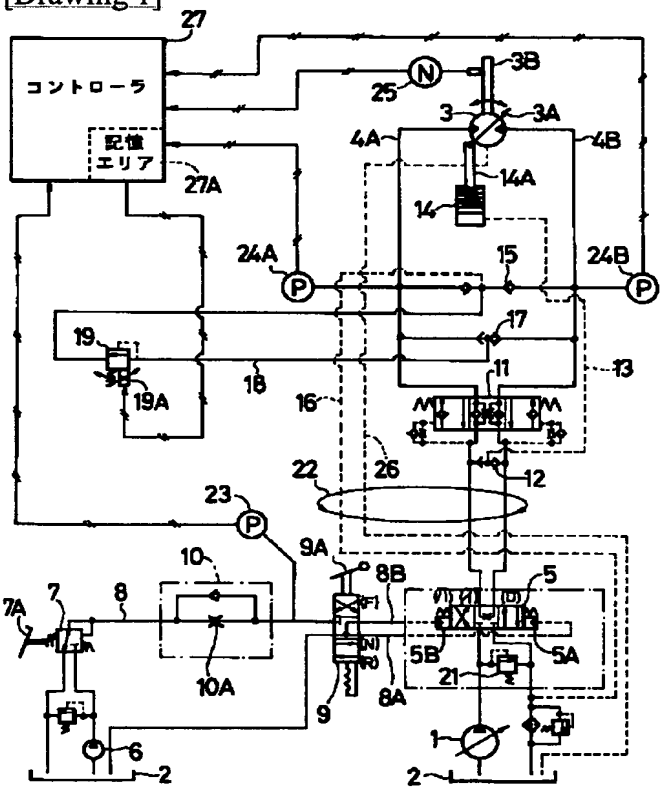
[Translation done.]

* NOTICES *

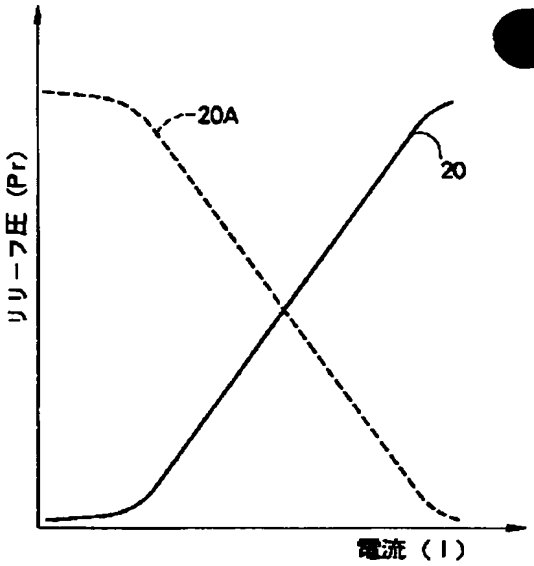
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

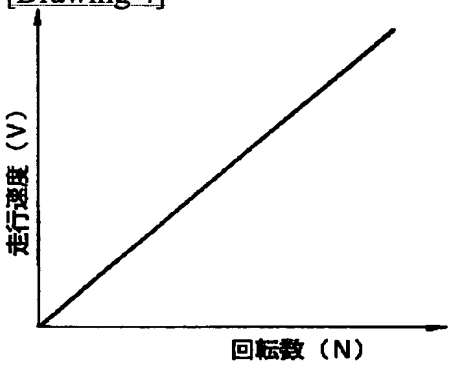
[Drawing 1]



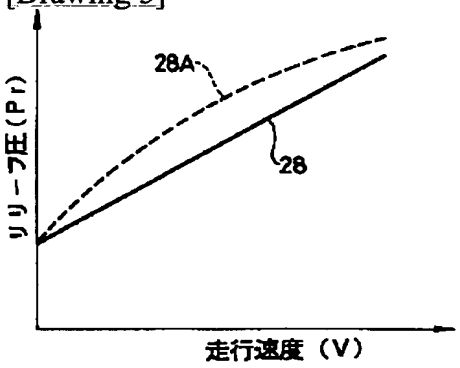
[Drawing 2]



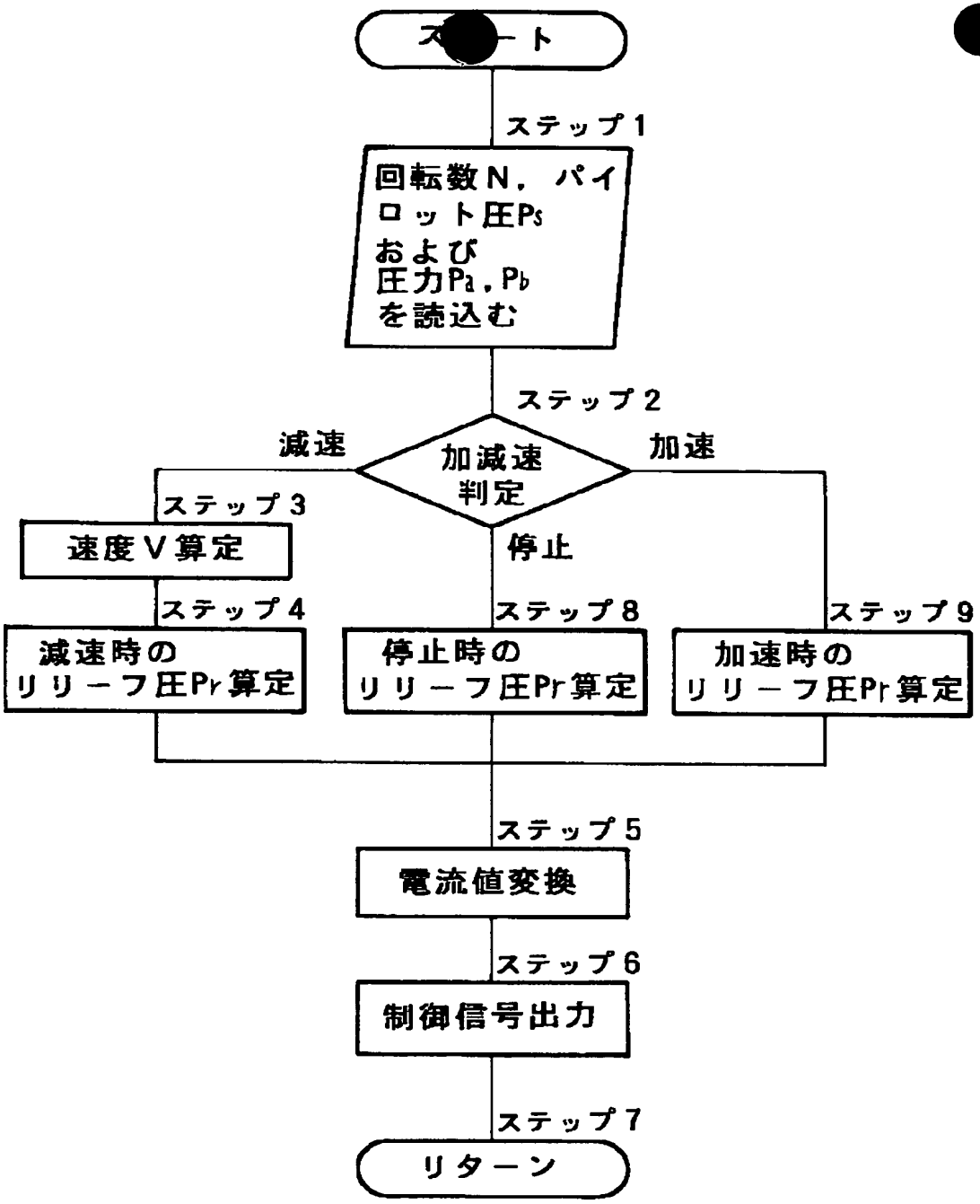
[Drawing 4]



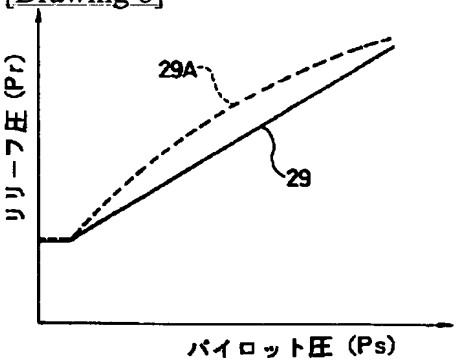
[Drawing 5]



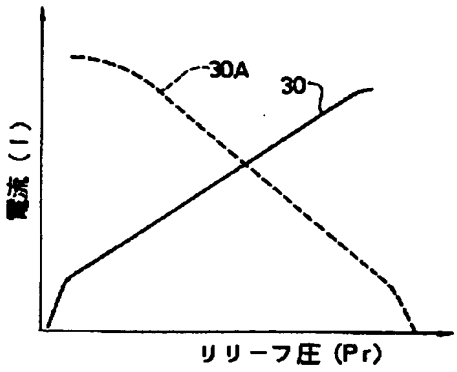
[Drawing 3]



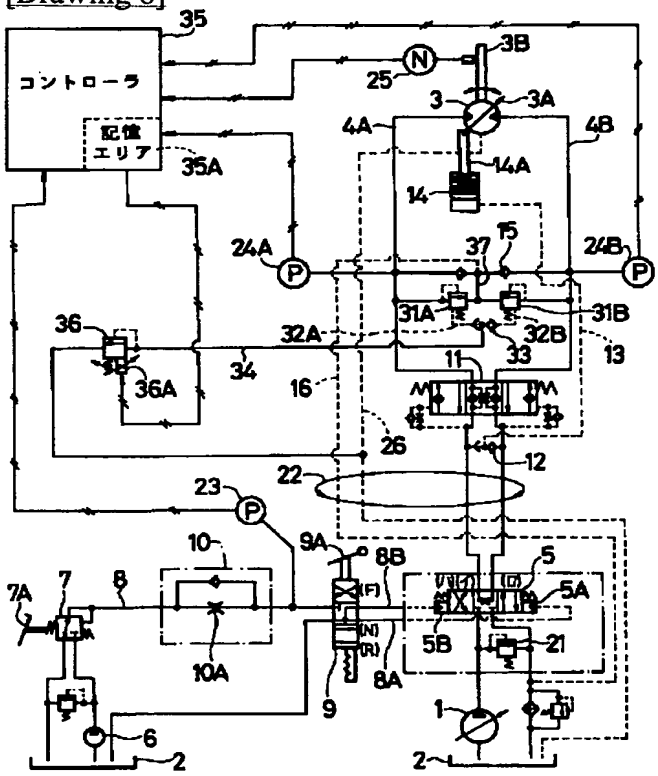
[Drawing 6]



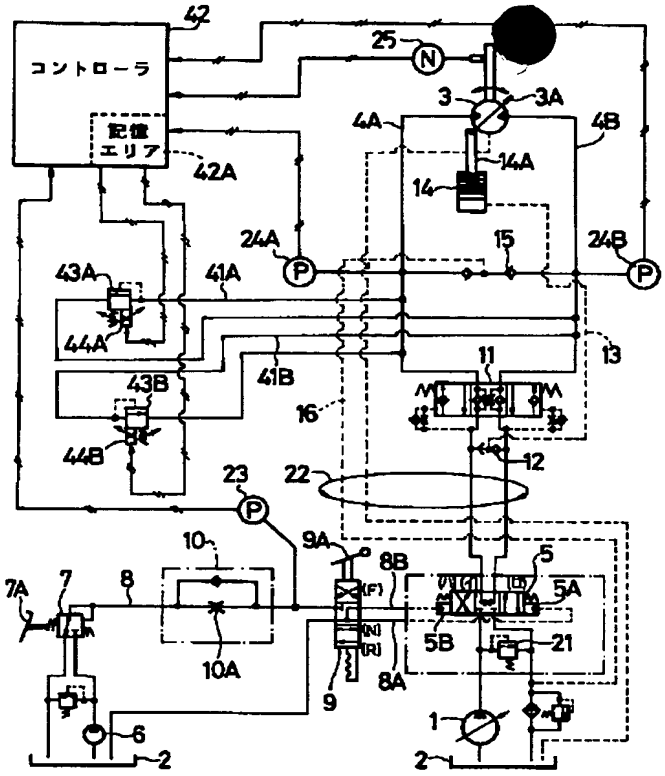
[Drawing 7]



[Drawing 8]



[Drawing 9]



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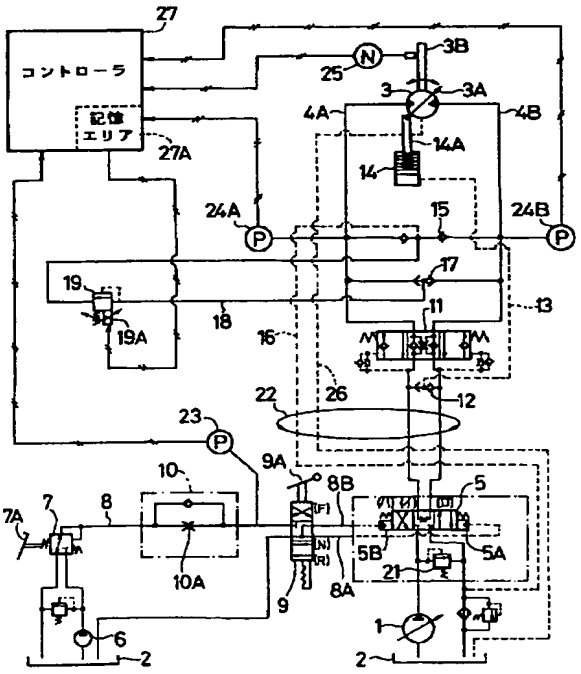
(54)【発明の名称】　作業車両の走行用油圧モータ駆動回路

(57)【要約】

【目的】　車両の走行状態を判別し、車両の全速度域に亘ってリリーフ圧を可変に設定して減速時や加速時の衝撃を効果的に緩和できるようにする。

【構成】　パイロット管路８内のパイロット圧を圧力センサ２３からコントローラ２７に読込み、コントローラ２７で走行ペダル７Ａの操作量に対応するパイロット圧等に基づき車両が減速中であるか、停止中であるか、または発進、加速中であるかを判別する。そして、減速中であると判別したときには、リリーフ弁１９のリリーフ設定圧をこのときの走行速度に対応したリリーフ圧に制御することにより、走行速度に対応する運動量または運動エネルギーをもって走行している車両に対して、このときの運動量または運動エネルギーに応じた制動圧力を油圧モータ３に作用させる。また、車両の停止時または発進時や加速時には、リリーフ弁１９のリリーフ設定圧をこのときのパイロット圧に対応する停止時または発進、加速時に適したリリーフ圧に制御する。



圧モータ駆動回路は、例えば実開平２－１４４８２４号公報等によって知られている。

【０００３】この種の従来技術では、走行用の操作手段を操作して制御弁を中立位置から切換操作し、油圧ポンプからの圧油を油圧モータに給排することにより、前，後の車輪（ホイール）等を回転駆動して車両を路上走行させるようにしている。そして、路上走行の途中で前記操作手段の操作量を小さくし、車両を急減速させるときには、操作量検出手段の検出値が小さくなるので、これによりリリーフ弁装置が作動して、前記油圧モータの制動圧力をオーバロードリリーフ弁のリリーフ設定圧よりも低い圧力に設定し、このときの制動圧力をリリーフ弁装置で低圧リリーフすることによって減速時の衝撃を緩和させるようにしている。

【０００４】また、この従来技術による走行用油圧モータ駆動回路は、前記油圧ポンプの吐出側に位置してタンクとの間に設けられ、前記油圧モータの駆動圧力が所定の高圧レベルを越えたときに、圧力をリリーフさせるメインのリリーフ弁と、前記操作量検出手段の検出値に応じて作動し、前記油圧モータの駆動圧力を前記メインのリリーフ弁のリリーフ設定圧よりも低い圧力に設定する他のリリーフ弁装置とを備え、車両を急発進、急加速するときには、前記走行用の操作手段が操作量の小さい状態から立ち上るので、前記操作量検出手段の検出値も小さい状態から立ち上るようになり、前記他のリリーフ弁装置は油圧モータの駆動圧力を前記メインのリリーフ弁のリリーフ設定圧よりも低い圧力に設定し、このときの駆動圧力を他のリリーフ弁装置で低圧リリーフすることによって発進時、加速時の衝撃を緩和させるようにしている。

【０００５】

【発明が解決しようとする課題】ところで、上述した従来技術では、車両の減速時に操作手段の操作量に応じてリリーフ弁装置を作動させ、油圧モータの制動圧力をオーバロードリリーフ弁のリリーフ設定圧よりも低い圧力に設定しているに過ぎないから、このときの制動圧力を車両の走行速度に対応した圧力に設定できず、減速時の衝撃を効果的に緩和させることができないという問題がある。

【０００６】また、車両の急発進、急加速時でも減速時とほぼ同様に他のリリーフ弁装置を作動させ、油圧モータの駆動圧力をメインのリリーフ弁のリリーフ設定圧よりも低い圧力に設定しているに過ぎず、発進時や加速時の衝撃を効果的には緩和できないという問題がある。

【０００７】さらに、減速時のリリーフ圧を設定するリリーフ弁装置と発進時、加速時のリリーフ圧を設定する他のリリーフ弁装置とを別個に設ける必要があり、全体の構造が複雑化するという問題がある。

【０００８】一方、他の従来技術として、車両の加速時には油圧モータの駆動圧力をメインのリリーフ弁によって設定し、車両の減速時には油圧モータの制動圧力を比較的低圧のオーバロードリリーフ弁により設定し、制御弁が中立位置に戻されるまでは、該オーバロードリリーフ弁の作動を禁止するようにした作業車両の走行用油圧モータ駆動回路が、例えば特開平２－２４３８３３号により提案されている。しかし、この場合には、発進時や加速時の衝撃を緩和できず、減速時にはオーバロードリリーフ弁によって常に一定のリリーフ圧に設定されるに過ぎないから、減速時の衝撃を全速度域に亘って緩和できないという問題がある。

【０００９】本発明は上述した従来技術の問題に鑑みなされたもので、本発明は車両の走行状態を判別でき、車両の全速度域に亘ってリリーフ圧を可変に設定できると共に、減速時や加速時の衝撃を効果的に緩和できるようにした作業車両の走行用油圧モータ駆動回路を提供することを目的としている。

【００１０】

【課題を解決するための手段】上述した課題を解決するために本発明は、車両に搭載され、原動機によって駆動される油圧ポンプと、該油圧ポンプとタンクとに一対の主管路を介して接続され、該油圧ポンプからの圧油が給排されることにより前記車両を走行させる走行用の油圧モータと、該油圧モータと油圧ポンプ、タンクとの間に位置して前記各主管路の途中に設けられ、該油圧モータに給排される圧油の流量および方向を制御する制御弁と、該制御弁を操作量に応じて切換操作する走行用の操作手段と、該操作手段の操作量を検出する操作量検出手段と、前記油圧モータと制御弁との間に位置して前記各主管路の途中に設けられ、前記油圧モータに作用する圧力が所要の設定圧を越えたときに、このときの過剰圧をリリーフさせる可変式のリリーフ圧設定手段と、前記車両の走行速度を検出する速度検出手段と、少なくとも前記操作量検出手段からの信号に基づき前記車両の走行状態を判別する走行状態判別手段と、該走行状態判別手段によって前記車両が減速中であると判別したときに、前記リリーフ圧設定手段の設定圧を前記速度検出手段からの信号に基づき減速時に適した圧力に制御するように、前記リリーフ圧設定手段に減速用の制御信号を出力する制御信号出力手段とからなる構成を採用している。

【００１１】また、前記制御信号出力手段は、前記走行状態判別手段によって前記車両が加速中であると判別したときに、前記リリーフ圧設定手段の設定圧を前記操作量検出手段からの信号に基づき加速時に適した圧力に制御するように、前記リリーフ圧設定手段に加速用の制御信号を出力する構成としてもよい。

【００１２】さらに、前記制御信号出力手段は、前記走行状態判別手段によって前記車両が停止中であると判別したときに、前記リリーフ圧設定手段の設定圧を停止時に適した圧力に制御する構成としてもよい。

【００１３】一方、前記走行状態判別手段は、前記操作

速弁としてのスローリターン弁を示し、該スローリターン弁１０は絞り１０Ａを有し、走行ペダル７Ａの踏込み操作を解除したときに、制御弁５が早期に中立位置（イ）に戻ってしまうのを絞り１０Ａによって抑えるようになっている。

【００２７】１１は油圧モータ３と制御弁５との間に位置して主管路４Ａ，４Ｂの途中に設けられたカウンタバランス弁を示し、該カウンタバランス弁１１は前進または後進の駆動圧に連動して切換わり、制御弁５が中立位置（イ）に復帰し駆動圧が減少したときにはこれに連動して図示の位置に復帰し、油圧モータ３の制動圧力を主管路４Ａまたは４Ｂ内に発生させる。

【００２８】１２は制御弁５とカウンタバランス弁１１との間に位置して主管路４Ａ，４Ｂ間に設けられた高圧選択弁としてのシャトル弁を示し、該シャトル弁１２は主管路４Ａ，４Ｂのうち、高圧側となる主管路４Ａまたは４Ｂを選択し、例えば油圧モータ３の駆動圧力を制御管路１３内に導くことにより、後述のサーボシリンダ１４で油圧モータ３の容量をこのときの駆動圧力に応じて切換えさせる。

【００２９】１４は油圧モータ３に付設されたサーボシリンダを示し、該サーボシリンダ１４は駆動ロッド１４Ａの先端が油圧モータ３の容量可変部３Ａに連結され、制御管路１３からの圧力に応じて油圧モータ３の容量可変部３Ａを傾転駆動する。そして、該サーボシリンダ１４は容量可変部３Ａを常時は小容量側に傾転して、油圧モータ３を小トルクで高速回転させ、制御管路１３からの圧力、即ちモータ自己圧となる駆動圧力が所定圧を越えたときに容量可変部３Ａを大容量側に傾転し、油圧モータ３を大トルクで低速回転させる。

【００３０】１５は油圧モータ３とカウンタバランス弁１１との間に位置して主管路４Ａ，４Ｂ間に設けられたメイクアップ用チェック弁を示し、該チェック弁１５はタンク管路１６を介してタンク２と接続され、油圧モータ３の制動時等に主管路４Ａまたは４Ｂ内が負圧傾向となると、タンク２内の作動油を主管路４Ａまたは４Ｂに補給させることにより、キャビテーションの発生を防止する。

【００３１】１７は油圧モータ３とカウンタバランス弁１１との間に位置して主管路４Ａ，４Ｂ間に設けられた高圧選択弁としての他のシャトル弁を示し、該シャトル弁１７は主管路４Ａ，４Ｂのうち、油圧モータ３とカウンタバランス弁１１との間で高圧側となる主管路４Ａまたは４Ｂを選択し、高圧側の圧油を他のタンク管路１８内に導く。そして、該タンク管路１８はメイクアップ用チェック弁１５の位置で前記タンク管路１６を介してタンク２に接続されている。

【００３２】１９はシャトル弁１７およびタンク管路１８と共にリリーフ圧設定手段を構成する設定圧可変式のリリーフ弁を示し、該リリーフ弁１９はタンク管路１８の途中に設けられ、電磁比例ソレノイド部１９Ａによりそのリリーフ圧Ｐｒが図２に実線で示す特性２０をもって可変に設定される。そして、該リリーフ弁１９はシャトル弁１７を介してタンク管路１８に導かれる圧油の圧力が電磁比例ソレノイド部１９Ａによるリリーフ設定圧を越えたときに開弁し、この圧力をタンク管路１６を介してタンク２へとリリーフさせることにより、油圧モータ３に過剰圧が作用するのを防止する構成となっている。

【００３３】また、２１は油圧ポンプ１、タンク２と制御弁５との間に位置して該油圧ポンプ１の吐出側に設けられたメインのリリーフ弁を示し、該リリーフ弁２１は油圧ポンプ１から吐出される圧油の圧力、例えば油圧モータ３の駆動圧力等が所定の高圧レベル（リリーフ設定圧）を越えると、この圧力をリリーフし、油圧ポンプ１や油圧モータ３等に過剰圧が作用するのを防止する。

【００３４】２２は制御弁５とカウンタバランス弁１１との間に位置して主管路４Ａ，４Ｂ等の途中に設けられたセンタジョイントを示し、該センタジョイント２２はホイール式油圧ショベルの下部走行体と上部旋回体（いずれも図示せず）との間に設けられ、上部旋回体の旋回時にも油圧ポンプ１からの圧油を油圧モータ３に給排できるようにしている。即ち、油圧モータ３，カウンタバランス弁１１等は下部走行体に設けられ、油圧ポンプ１，６、制御弁５およびパイロット弁７等は上部旋回体に設けられている。

【００３５】２３は前後進切換弁９とスローリターン弁１０との間に位置してパイロット管路８の途中に設けられた操作量検出手段としての圧力センサを示し、該圧力センサ２３はパイロット管路８内のパイロット圧Ｐｓを走行ペダル７Ａの操作量（踏込み量）として検出し、検出信号を後述のコントローラ２７に出力する。

【００３６】２４Ａ，２４Ｂは油圧モータ３とカウンタバランス弁１１との間に位置して主管路４Ａ，４Ｂの途中に設けられた一対の圧力検出手段としての圧力センサを示し、該圧力センサ２４Ａ，２４Ｂは主管路４Ａ，４Ｂ内の圧力Ｐａ，Ｐｂをそれぞれ検出し、その検出信号をコントローラ２７に出力する。

【００３７】２５は油圧モータ３の出力軸３Ｂ近傍に設けられた速度検出手段としての回転数センサを示し、該回転数センサ２５は油圧モータ３の回転数Ｎを検出し、その検出信号をコントローラ２７に出力する。

【００３８】２６は油圧モータ３のドレン管路を示し、該ドレン管路２６はタンク管路１６と共にセンタジョイント２２を介してタンク２に接続され、油圧モータ３で発生する漏洩油（圧油の一部）をタンク２内に排出させる。

【００３９】さらに、２７はマイクロコンピュータ等からなる制御装置としてのコントローラを示し、該コントローラ２７はその入力側が圧力センサ２３，２４Ａ，２

離し操作され、油圧ポンプ１から油圧モータ３に給排される圧油量が制御弁５で減少されることから、このときには車両は減速状態にあると判別でき、後述するステップ３以降の処理を行う。また、走行ペダル７Ａの操作が解除され、主管路４Ａ，４Ｂ内の圧力Ｐａ，Ｐｂが実質的に等しくなっているとき、または油圧モータ３の回転数Ｎが零となっているときには、車両は停止中であると判別できるので、後述するステップ８の処理を行う。一方、圧力センサ２３で検出したパイロット圧Ｐｓが増加しているときには走行ペダル７Ａが踏込み操作され、車両が発進するときか、または走行ペダル７Ａの操作量が大きくなって油圧モータ３に給排される圧油の流量が増大し、車両は加速状態にあると判別できるから、後述するステップ９の処理を行う。

【００５０】そして、ステップ２で車両が減速中であると判別したときには、ステップ３で図４に実線で示す走行速度マップから前記回転数Ｎに基づき車両の走行速度Ｖを算定し、ステップ４に移って図５に実線で示す特性２８のリリーフ圧算定マップから車両の走行速度Ｖに基づき減速時のリリーフ圧Ｐｒを算定する。

【００５１】次に、ステップ５ではこのときのリリーフ圧Ｐｒを図７に実線で示す特性３０の電流値変換マップにより電流値に変換し、ステップ６に移ってこの電流値に該当する減速用の制御信号をリリーフ弁１９の電磁比例ソレノイド部１９Ａに出力することにより、リリーフ弁１９のリリーフ設定圧がこのときの走行速度Ｖに対応したリリーフ圧Ｐｒとなるように制御し、ステップ７でリターンする。

【００５２】また、ステップ２で車両が停止中であると判別したときには、ステップ８に移って予め記憶エリア２７Ａ内に設定している設定値から停止時に適したリリーフ圧Ｐｒを算定し、ステップ５でこのときのリリーフ圧Ｐｒを図７に示す電流値変換マップにより電流値に変換し、ステップ６に移ってこの電流値に該当する停止時用の制御信号をリリーフ弁１９の電磁比例ソレノイド部１９Ａに出力することにより、リリーフ弁１９のリリーフ設定圧が停止時に適したリリーフ圧Ｐｒとなるように制御する。

【００５３】さらに、ステップ２で車両が加速中であると判別したときには、ステップ９に移って図６に示すリリーフ圧算定マップからこのときのパイロット圧Ｐｓに基づき加速時に適したリリーフ圧Ｐｒを算定し、ステップ５でこのときのリリーフ圧Ｐｒを図７に示す電流値変換マップにより電流値に変換し、ステップ６に移ってこの電流値に該当する加速用の制御信号をリリーフ弁１９の電磁比例ソレノイド部１９Ａに出力することにより、リリーフ弁１９のリリーフ設定圧がこのときの加速状態に適したリリーフ圧Ｐｒとなるように制御する。

【００５４】かくして、本実施例によれば、走行ペダル７Ａの操作量に対応するパイロット圧Ｐｓ等に基づき車両が減速中であるか、停止中であるか、または発進、加速中であるかを確実に判別でき、減速中であると判別したときには、リリーフ弁１９のリリーフ設定圧をこのときの走行速度Ｖに対応したリリーフ圧Ｐｒに制御することにより、走行速度Ｖに対応する運動量または運動エネルギーをもって走行している車両に対して、このときの運動量または運動エネルギーに応じた制動圧力を油圧モータ３に作用させることができ、制動圧力が過大となったり、過小となったりするのを確実に防止できる。

【００５５】また、車両が停止中であると判別したときには、リリーフ弁１９のリリーフ設定圧を予め設定しておいた停止時に適したリリーフ圧Ｐｒに制御でき、車両を停止状態に保持できる。そして、車両の発進時や加速時には、リリーフ弁１９のリリーフ設定圧をこのときのパイロット圧Ｐｓに対応する発進、加速時に適したリリーフ圧Ｐｒに設定でき、油圧モータ３に作用する駆動圧力が過大となったときにリリーフ弁１９を開弁させて、このときの過剰圧をタンク管路１８，１６を介してタンク２へとリリーフさせることができる。

【００５６】従って本実施例では、急発進，急加速時等に油圧モータ３の駆動圧力を走行ペダル７Ａの操作量に対応したリリーフ圧Ｐｒまで確実に減圧するように制御でき、油圧モータ３によって車両を急発進，急加速させるときに衝撃が発生するのを効果的に防止できると共に、発進，加速等を走行ペダル７Ａの操作でスムーズに行なうことができる。

【００５７】また、車両の減速時には、車両の運動エネルギーに応じた制動圧力を油圧モータ３に作用させることができ、急減速時等に急ブレーキをかけたような衝撃が発生するのを効果的に防止できると共に、低速から高速に亘る車両の全速度域でリリーフ圧Ｐｒを可変に設定でき、操縦安定性や安全性を向上できる等、種々の効果を奏する。

【００５８】次に、図８は本発明の第２の実施例を示し、本実施例では前記第１の実施例と同一の構成要素に同一の符号を付し、その説明を省略するものとするに、本実施例の特徴は、油圧モータ３に作用する圧力が所要の設定圧を越えたときに、このときの過剰圧をリリーフさせる可変式のリリーフ圧設定手段を、カウンタバランス弁１１と油圧モータ３との間に位置して一対の主管路４Ａ，４Ｂ間にそれぞれ配設された一対のオーバロードリリーフ弁３１Ａ，３１Ｂと、該オーバロードリリーフ弁３１Ａ，３１Ｂのパイロット管路３２Ａ，３２Ｂ間に設けられ、該パイロット管路３２Ａ，３２Ｂのうち、高圧側を選択する高圧選択弁としてのシャトル弁３３と、該シャトル弁３３を油圧モータ３のドレン管路２６に接続する他のドレン管路３４の途中に設けられ、オーバロードリリーフ弁３１Ａ，３１Ｂのリリーフ圧Ｐｒをコントローラ３５からの制御信号により可変に制御する可変式の圧力制御弁３６とから構成したことにある。

で検出したパイロット圧Ｐｓ等に基づき車両の走行状態を判別するものとして述べたが、これに替えて、図３に示すステップ１で前後進切換弁９からの信号を読込むようにすれば、例えば前後進切換弁９が前進位置（Ｆ）に切換えられている状態で、主管路４Ａ，４Ｂのうち、主管路４Ａ内の圧力Ｐａが主管路４Ｂ内の圧力Ｐｂよりも高いときには、車両が加速状態にあると判別でき、主管路４Ｂ内の圧力Ｐｂが主管路４Ａ内の圧力Ｐａよりも高いときには減速状態にあると判別できる。また、前後進切換弁９が後進位置（Ｒ）に切換えられているときにも、これとほぼ同様に車両の減速時、加速時を判別でき、前後進切換弁９が中立位置（Ｎ）に切換えられている状態で、主管路４Ａ内の圧力Ｐａと主管路４Ｂ内の圧力Ｐｂとが等しいときには車両が停止中であると判別できる。

【００６９】さらに、前記各実施例では、コントローラ２７（３５，４２）の記憶エリア２７Ａ（３５Ａ，４２Ａ）内に、図５中に実線で例示した特性２８からなるリリーフ圧算定マップおよび図６中に実線で例示した特性２９からなるリリーフ圧算定マップ等を格納するものとして述べたが、これに替えて、図５、図６中に点線で示すような特性２８Ａ，２９Ａをもったリリーフ圧算定マップをそれぞれ記憶エリア２７Ａ（３５Ａ，４２Ａ）内に格納するようにしてもよい。

【００７０】一方、前記各実施例では、リリーフ弁１９（３１Ａ，３１Ｂ、４３Ａ，４３Ｂ）のリリーフ圧Ｐｒを電磁比例ソレノイド部１９Ａ（３６Ａ、４４Ａ，４４Ｂ）により図２に実線で示す特性２０をもって可変に設定するものとして述べたが、これに替えて、特性２０とは逆特性となる図２中に点線で示す特性２０Ａをもってリリーフ弁１９（３１Ａ，３１Ｂ、４３Ａ，４３Ｂ）のリリーフ圧Ｐｒを可変に設定するようにしてもよく、この場合には、断線事故等が起きたときにリリーフ弁１９（３１Ａ，３１Ｂ、４３Ａ，４３Ｂ）のリリーフ圧Ｐｒを最高圧に保持でき、フェイルセーフ機能を与えることができる。また、この場合には、図７中に点線で示す特性３０Ａからなる電流値変換マップを記憶エリア２７Ａ（３５Ａ，４２Ａ）内に格納する構成とすればよい。

【００７１】

【発明の効果】以上詳述した通り本発明によれば、油圧モータと制御弁との間に位置して各主管路の途中に過剰圧をリリーフさせる可変式のリリーフ圧設定手段を設け、少なくとも走行用の操作量検出手段からの信号に基づいて車両の走行状態が減速時であると判別したときには、リリーフ圧設定手段に減速用の制御信号を出力し、該リリーフ圧設定手段の設定圧を速度検出手段からの信号に基づいて減速時に適した圧力に制御する構成としたから、走行用の操作手段の操作量に基づき車両の走行状態を早期に判別でき、走行途中の車両が減速中であると判別したときに、該車両の走行速度に応じた減速時のリリーフ圧に設定できる。そして、走行速度に対応するエネルギーをもって走行している車両に対して、このときのエネルギーに対応した制動圧力を油圧モータに作用させることができ、制動圧力が過大となったり、過小となったりするのを確実に防止できる。

【００７２】また、車両の発進時や加速時には、前記操作手段の操作量に応じて加速時に適したリリーフ圧に設定でき、油圧モータに作用する駆動圧力が過大となったり、過小となったりするのを防止できる。そして、車両の停止時にはこれに適したリリーフ圧に設定でき、車両を停止状態に保持できる。

【００７３】従って、車両の全速度域に亘ってリリーフ圧を可変に設定でき、減速時や加速時の衝撃を効果的に緩和できる上に、操縦安定性や安全性を確実に向上させることができる等、種々の効果を奏する。

【図面の簡単な説明】

【図１】本発明の第１の実施例によるホイール式油圧ショベル用の油圧モータ駆動回路を示す油圧回路図である。

【図２】図１中のリリーフ弁によるリリーフ圧と電磁比例ソレノイド部に印加される制御信号の電流との関係を示す特性線図である。

【図３】コントローラによるリリーフ弁のリリーフ圧制御処理を示す流れ図である。

【図４】コントローラの記憶エリア内に格納された走行速度算定マップの説明図である。

【図５】コントローラの記憶エリア内に格納されたリリーフ圧算定マップの説明図である。

【図６】コントローラの記憶エリア内に格納された他のリリーフ圧算定マップの説明図である。

【図７】コントローラの記憶エリア内に格納された電流値変換マップの説明図である。

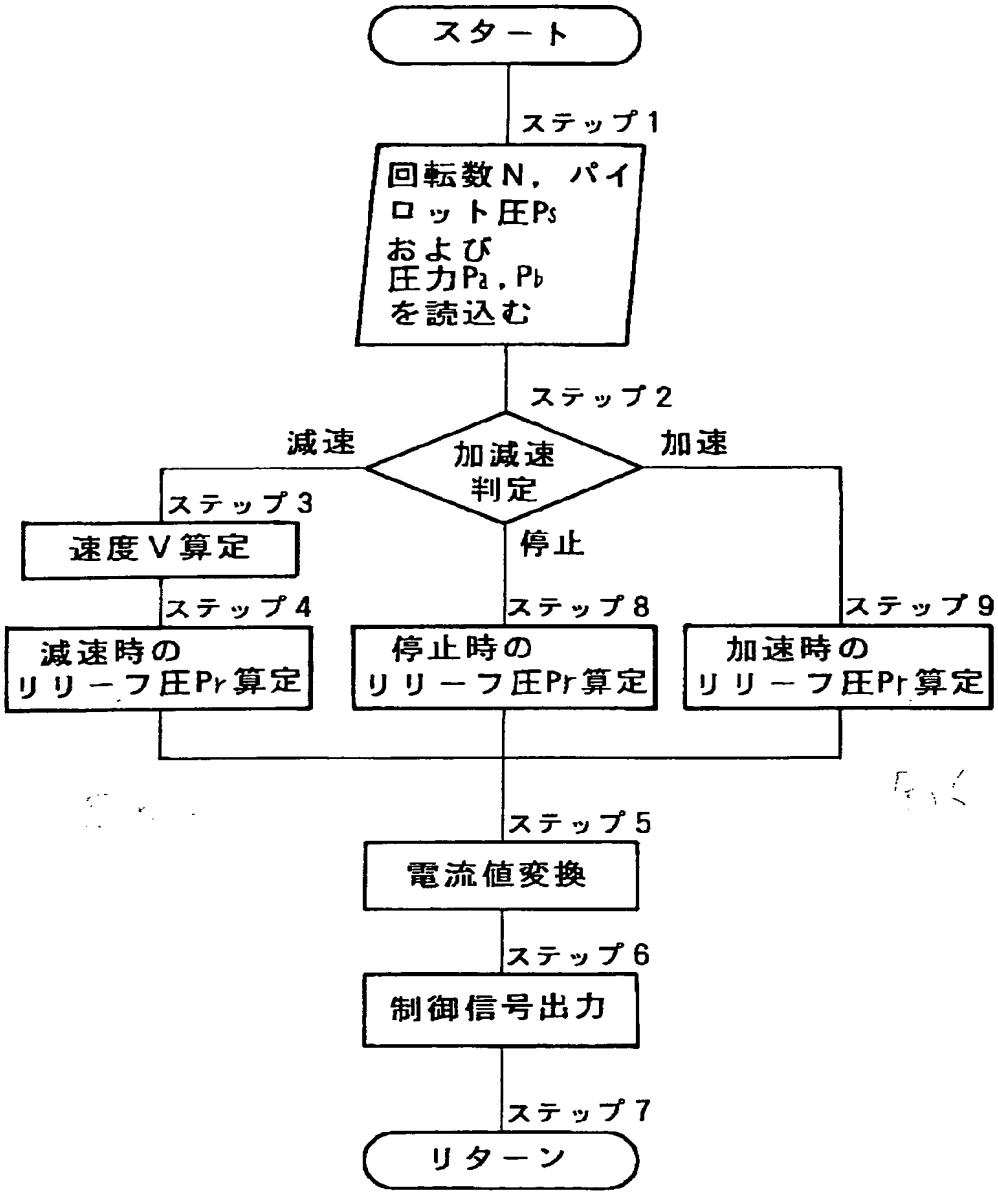
【図８】第２の実施例によるホイール式油圧ショベル用の油圧モータ駆動回路を示す油圧回路図である。

【図９】第３の実施例によるホイール式油圧ショベル用の油圧モータ駆動回路を示す油圧回路図である。

【符号の説明】

１　油圧ポンプ
２　タンク
３　油圧モータ
４Ａ，４Ｂ…主管路
５　制御弁
７　パイロット弁（操作手段）
７Ａ　走行ペダル
８　パイロット管路
９　前後進切換弁
１１　カウンタバランス弁
１６，１８　タンク管路
１７　シャトル弁（高圧選択弁）
１９，４３Ａ，４３Ｂ　リリーフ弁（リリーフ圧設定手

【図３】


スタート
ステップ１
回転数Ｎ，パイロット圧Ps および 圧力Pa，Pb を読込む
ステップ２
減速
加減速判定
加速
停止
ステップ３
速度Ｖ算定
ステップ４
減速時のリリーフ圧Pr算定
ステップ８
停止時のリリーフ圧Pr算定
ステップ９
加速時のリリーフ圧Pr算定
ステップ５
電流値変換
ステップ６
制御信号出力
ステップ７
リターン